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Swetish et al.

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(54) **FOLDABLE FRAME STRUCTURE**

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(52) **U.S. Cl.** **135/140**; 135/144; 135/152; 135/153; 135/123; 403/119
(58) **Field of Search** 135/139, 140, 135/141, 142, 143, 144, 145, 146, 151, 152, 153, 114, 123; 403/171, 119; 211/195, 199, 105; 52/646, 645

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(57) **ABSTRACT**

A portable shelter is disclosed. The portable shelter includes a canopy and a frame supporting the canopy. The frame of the portable shelter includes a plurality of support poles and a plurality of cross poles. Each cross pole of the portable shelter is pivotally coupled between adjacent support poles for rotation about an axis parallel to the support poles. Each support pole moves between an extended position in which the support pole extends perpendicular to the cross poles and a collapsed position in which the support pole extends along the cross poles.

33 Claims, 6 Drawing Sheets

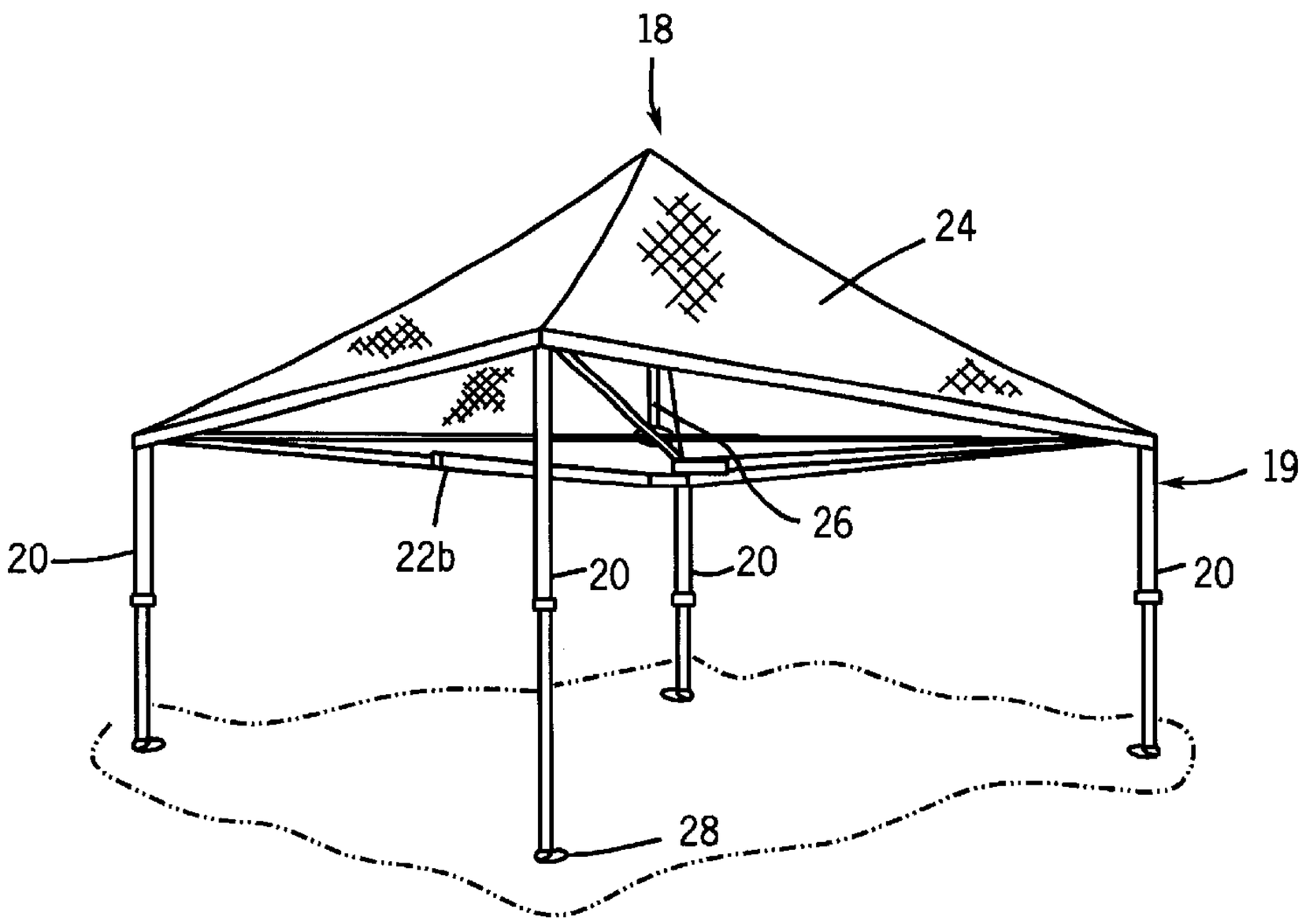


FIG. 1

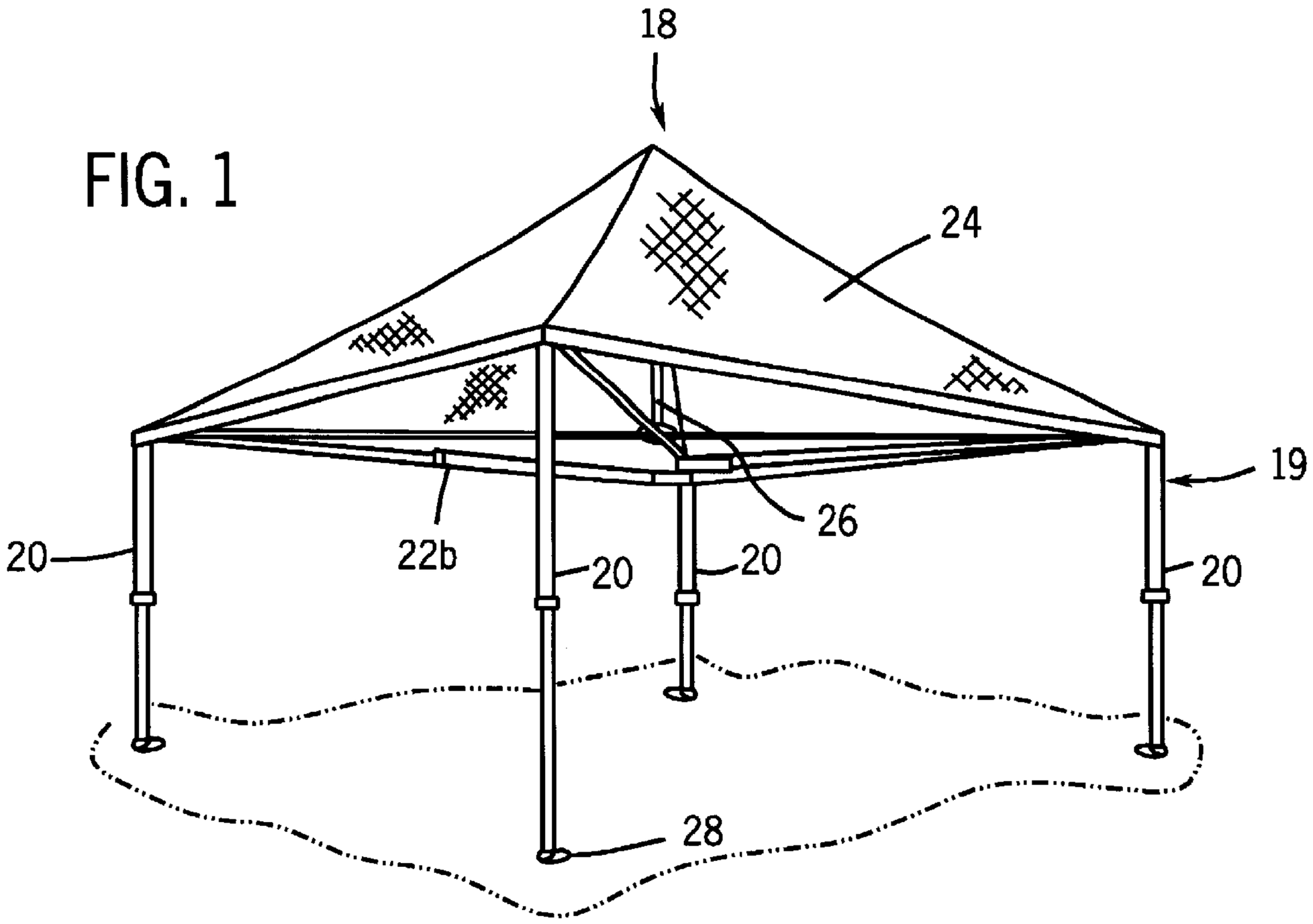


FIG. 2

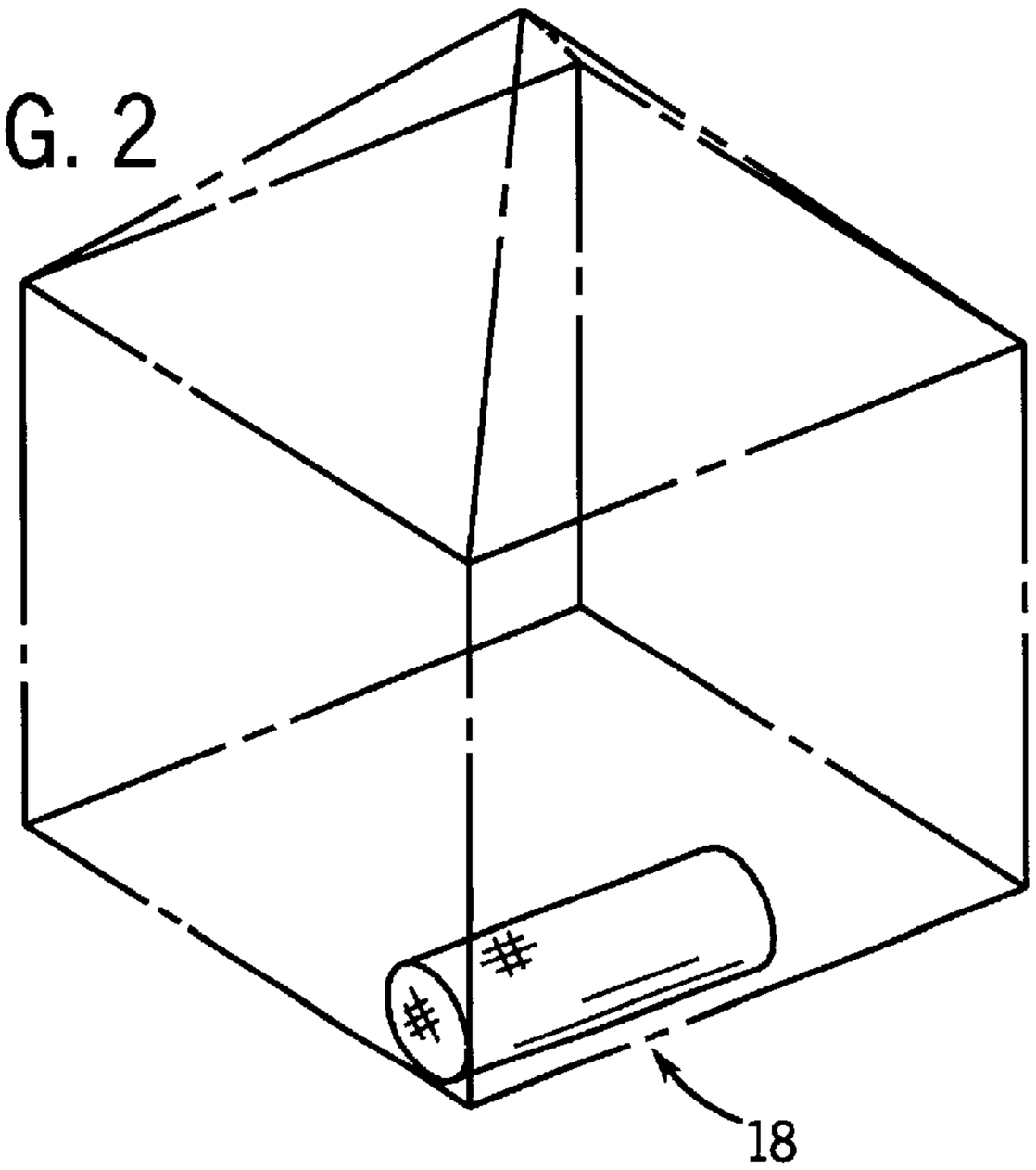


FIG. 3

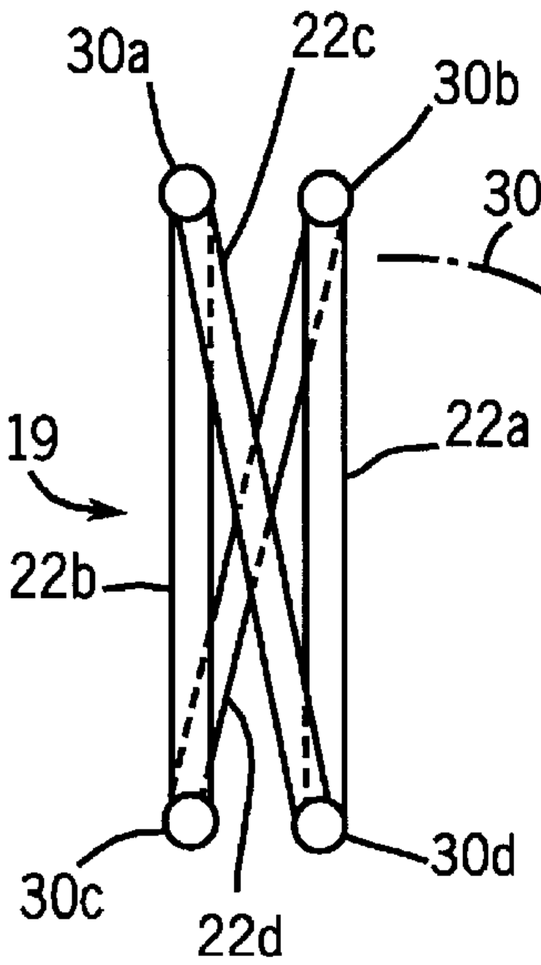


FIG. 5

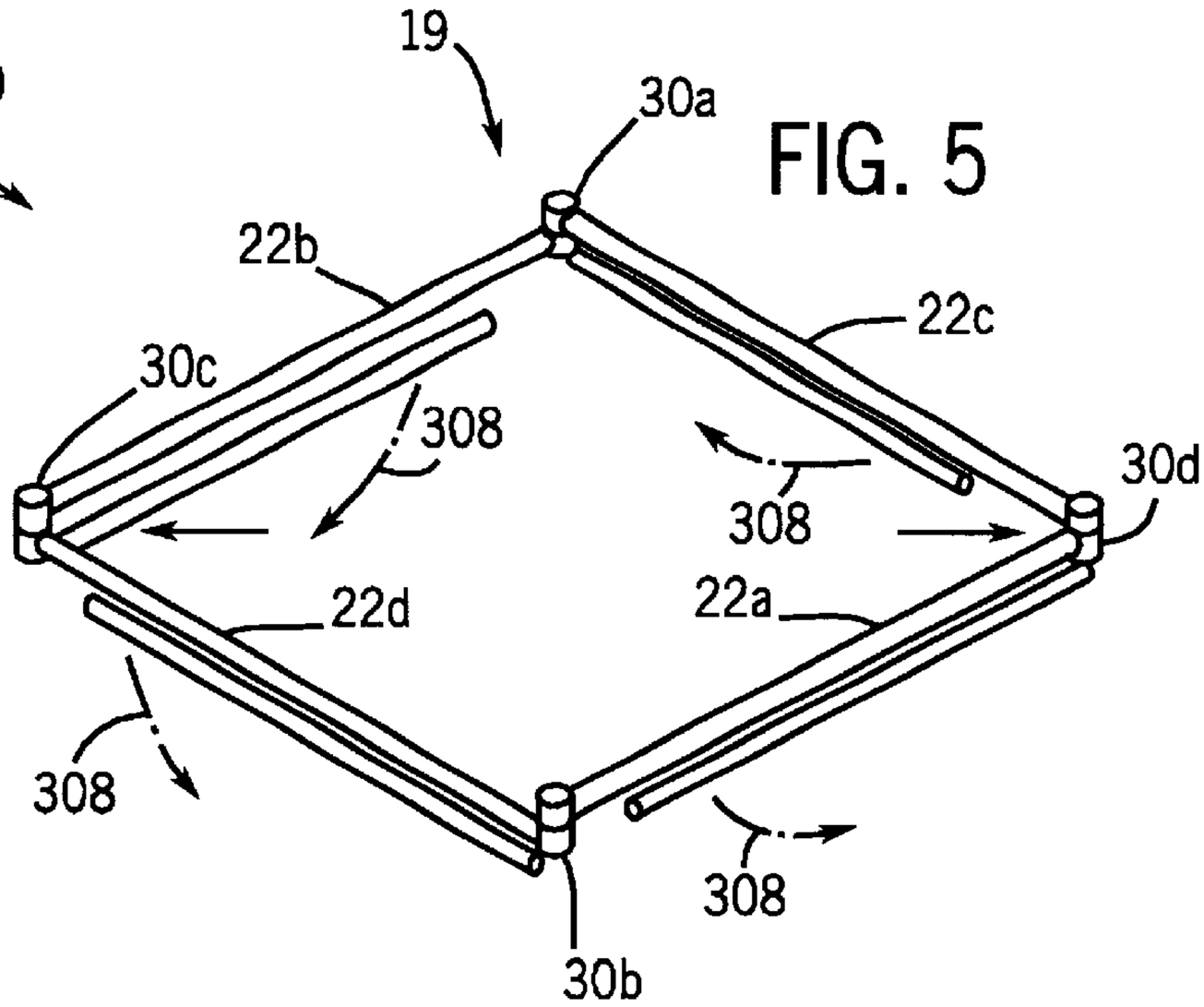
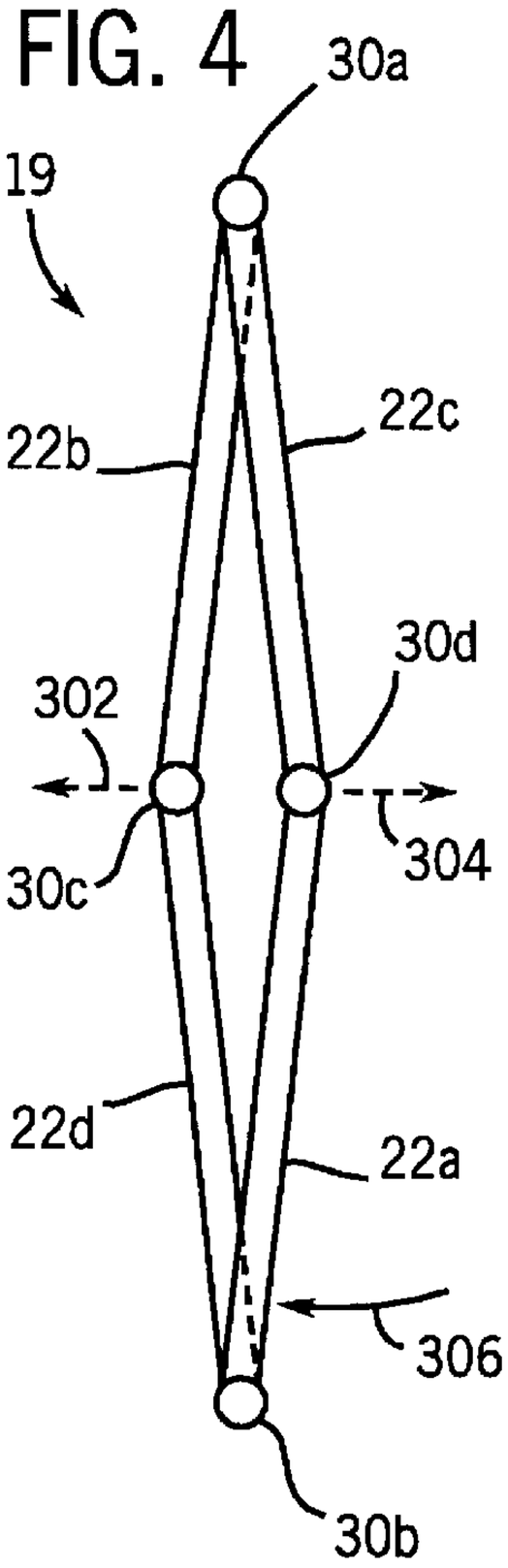


FIG. 4



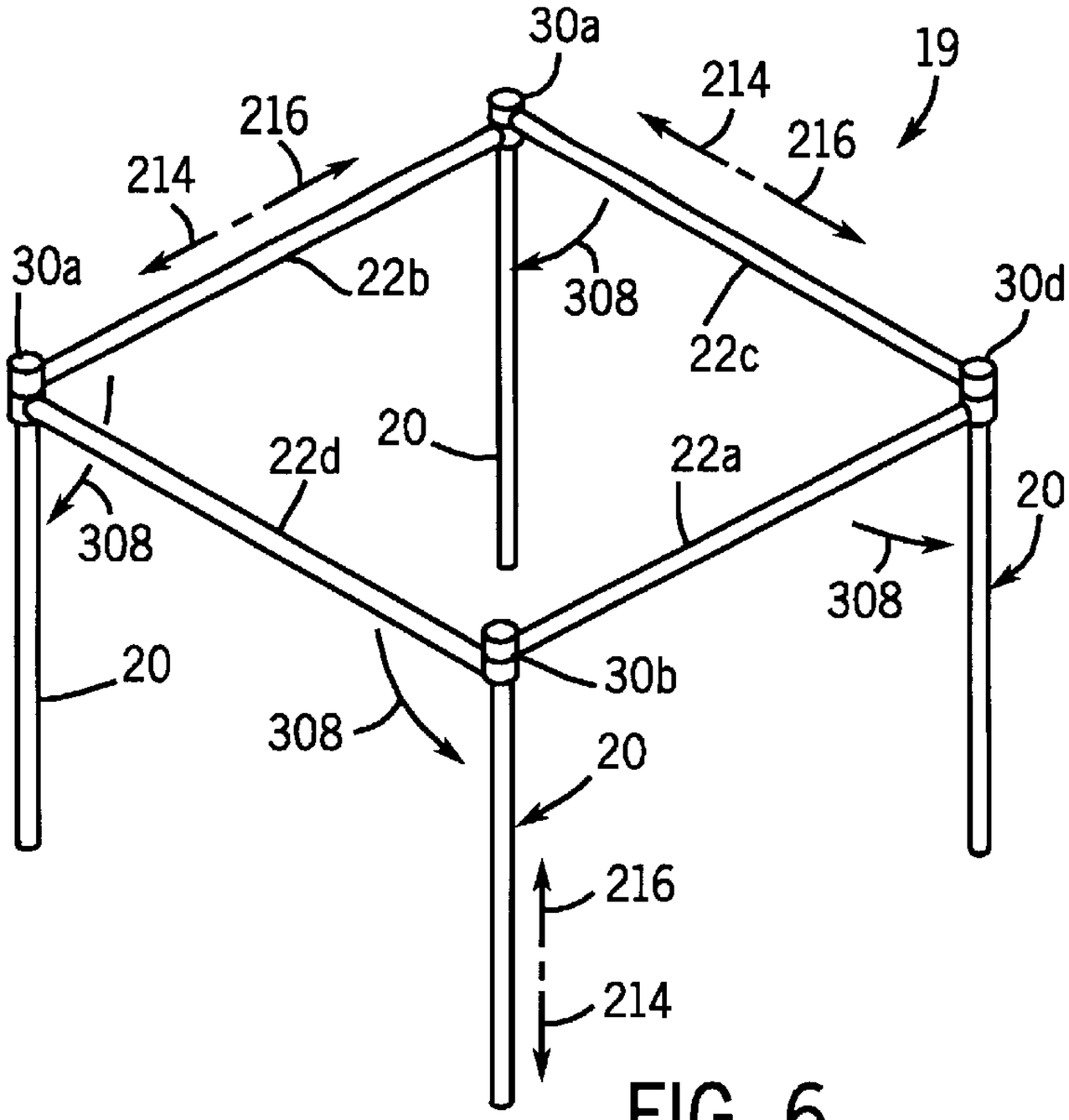
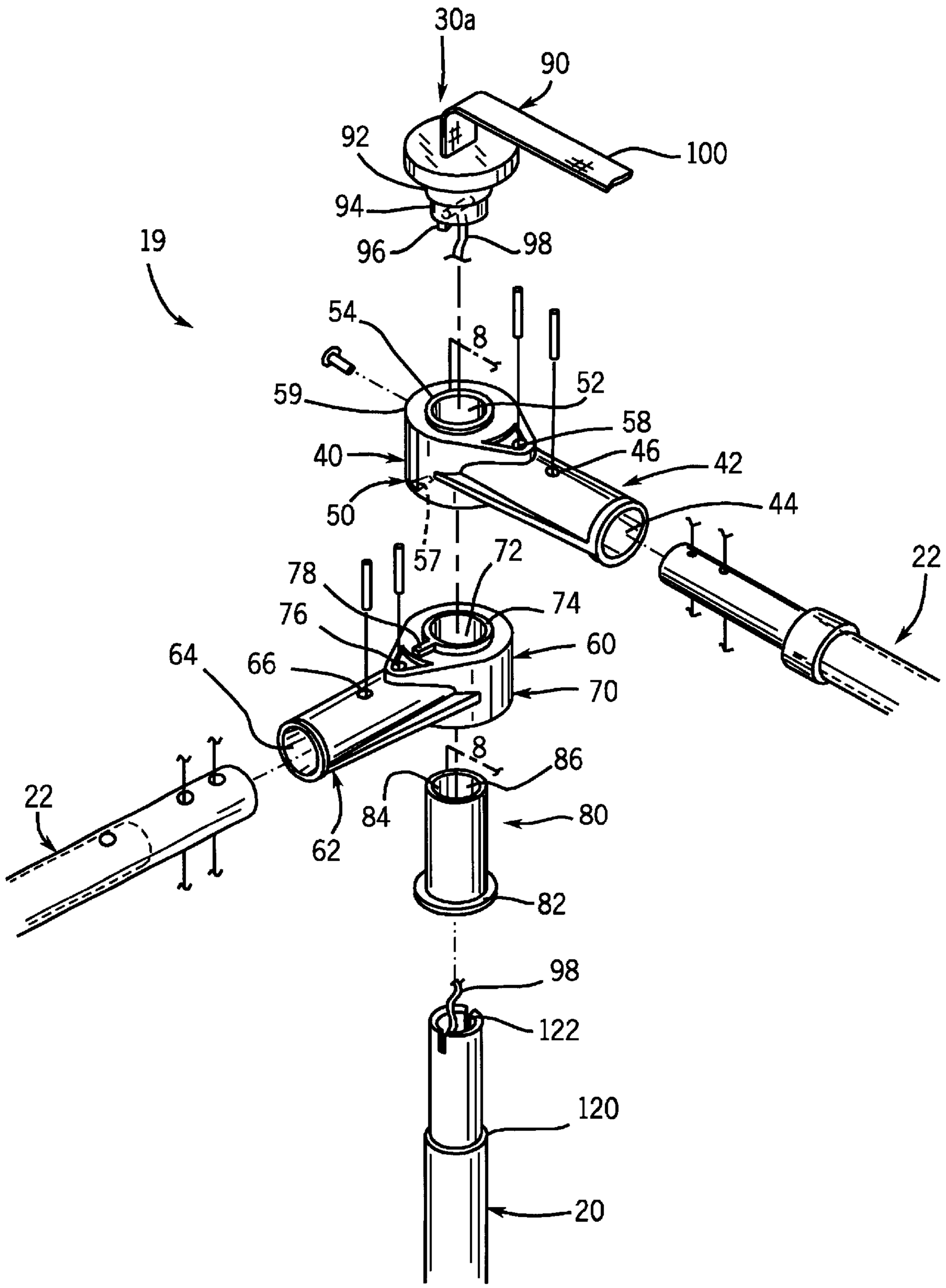


FIG. 6


30a
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92
100
94
96
98
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59
52
58
40
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72
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80
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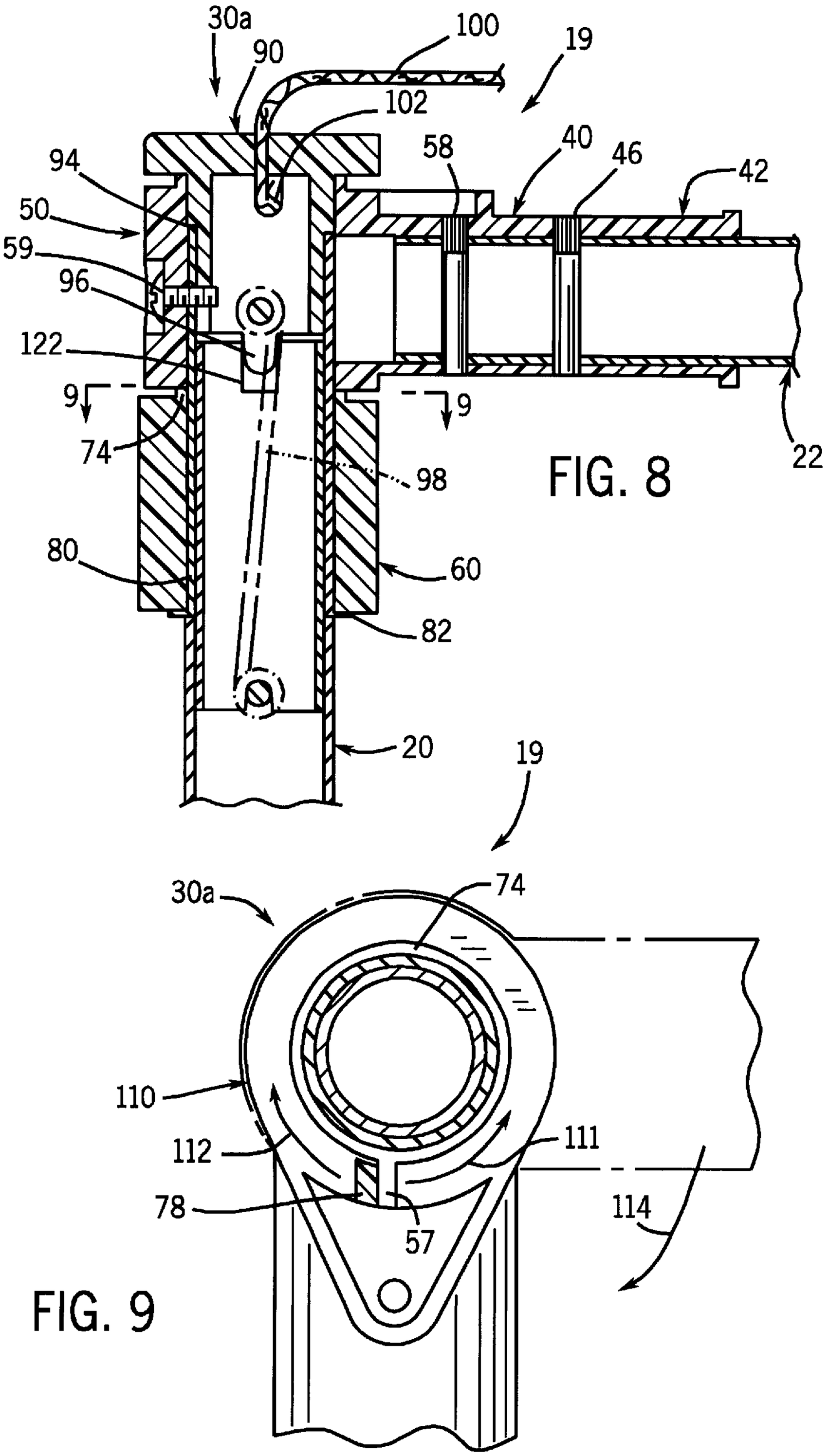
120
20

FIG. 7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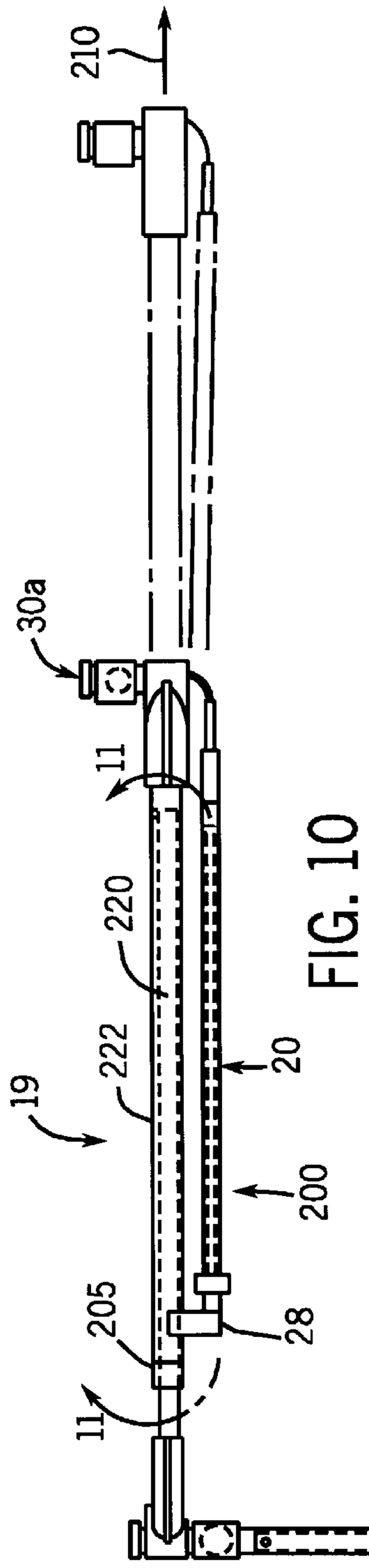
114

FIG. 8

FIG. 9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220
222
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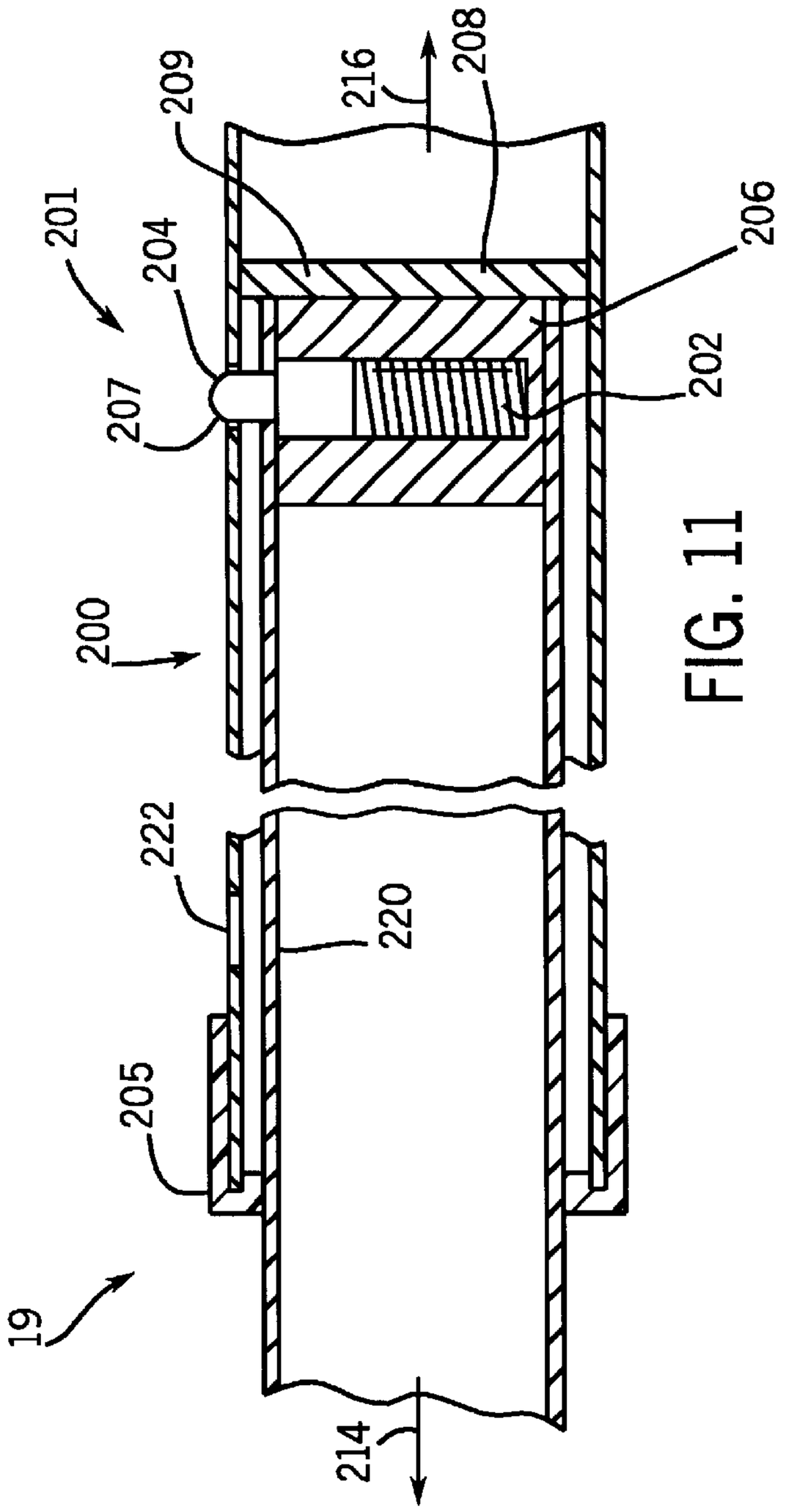
212

FIG. 10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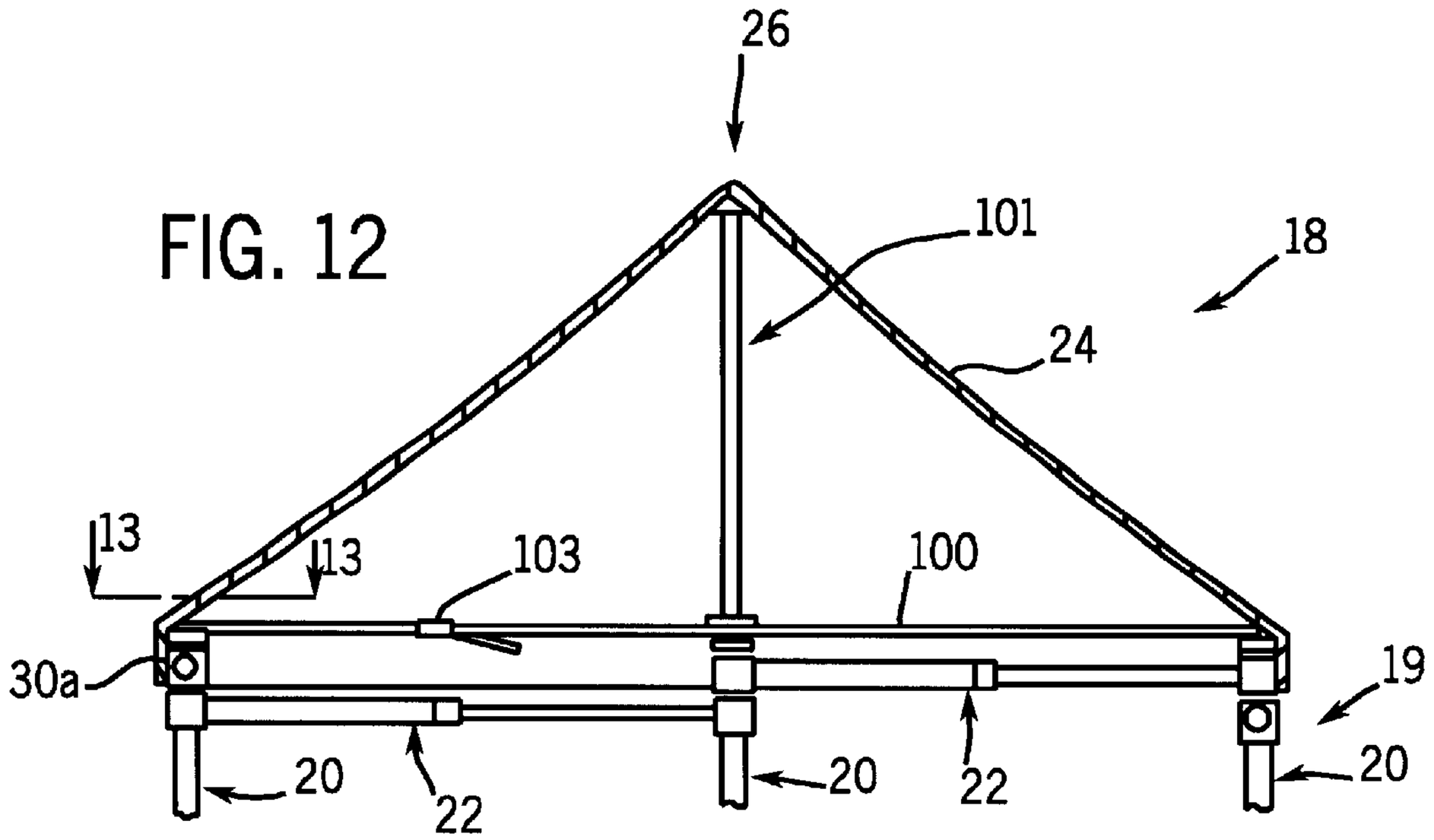
214

FIG. 11

FIG. 12



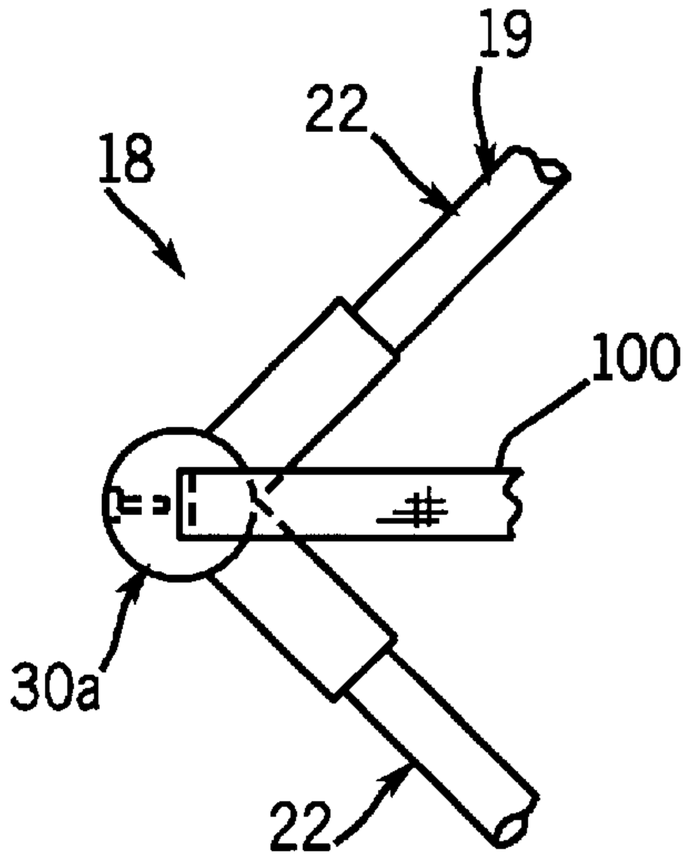


FIG. 13

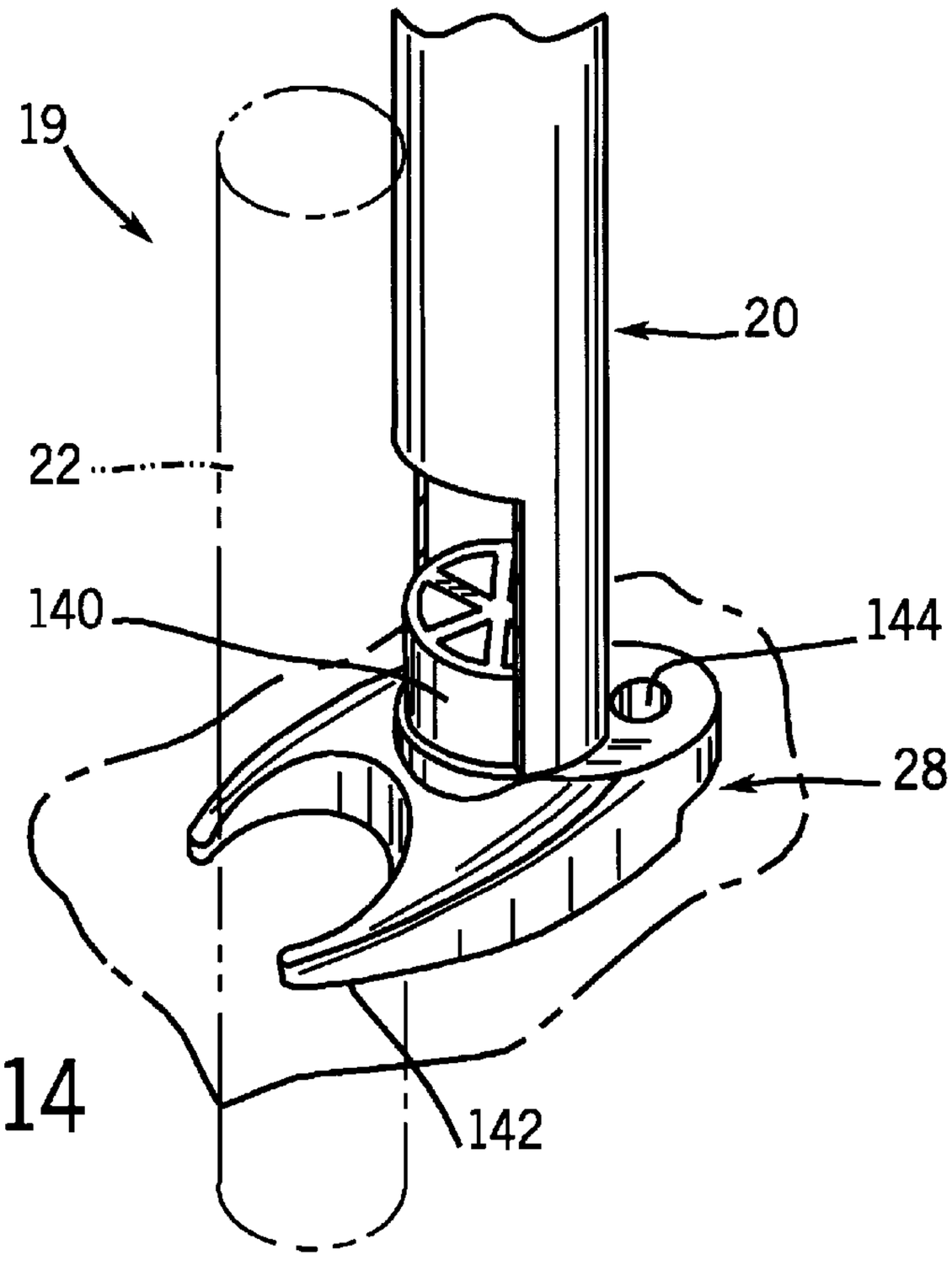


FIG. 14

FOLDABLE FRAME STRUCTURE

FIELD OF THE INVENTION

The present invention relates to foldable canopy structures that collapse into readily portable units. In particular, the present invention relates to a foldable unit that provides a simplified structure having a plurality of pivotal joints, each pivotal joint being coupled to two cross poles and releasably connected to a support pole enabling the foldable structure to be easily and simplistically expanded.

BACKGROUND OF THE INVENTION

Foldable canopy structures that collapse into a readily portable unit are well known in the outdoor products industry. Such canopy structures are generally used to protect users from the rain or sun for a wide variety of activities. The benefit of these foldable structures is that while the structure covers a large area when expanded, once collapsed it is small enough to be readily transported and stored. Recent advances in collapsible structures have made them both lighter and easier to assemble.

While portable shelters have undergone several recent advances, current shelters continue to have several deficiencies. One of the major drawbacks of existing structures is that to achieve a readily collapsible frame, existing structures are complex. Many of these structures heavily rely on complicated elements such as scissor joints. Additionally, the structures require complicated folding arrangements, detailed configurations and numerous elements. The complexity of the systems limits the ease of use for such structures.

The complexity of the current collapsible systems also adds weight to the structures. The result is that weight becomes a factor with even the lightest of existing systems. The additional weight makes the structures more difficult to collapse. Additionally once the structure is collapsed the structures are more difficult to move. This compromises many of the potential benefits of portability.

Another drawback of existing structures is that the complexity and the mechanics of the structures require a two-person set-up. While existing structures do offer some conveniences, the two-person set-up requirement limits both the ease of consumer use and the gamete of practical uses for these shelters.

As a result, there is a continuing need for a foldable and portable canopy structure that provides a simplified structure, that eliminates the need for a two-person set-up, and that provides a lighter structure that will facilitate set-up, take-down, and portability.

SUMMARY OF THE INVENTION

The present invention relates to foldable canopy structures that collapse into readily portable units. In particular, the present invention relates to a foldable unit that provides a simplified structure having a plurality of pivotal joints, each pivotal joint being coupled to two cross poles and releasably connected to a support pole enabling the foldable structure to be easily and simplistically expanded.

In accordance with one aspect of the present invention, the foldable structure consists of a frame. The frame includes a plurality of support poles and a plurality of cross poles. Each cross pole is pivotally coupled between adjacent support poles for rotation about an axis parallel to the support poles.

In accordance with yet another aspect of the present invention, the frame structure includes a plurality of support poles and a plurality of cross poles. Each support pole includes a first section and a second section telescopically receiving the first section. Each support pole is flexibly coupled to adjacent cross poles for folding about an axis parallel to the cross poles. Each cross pole includes a first section and a second section telescopically receiving the first section. Each cross pole is pivotally coupled between adjacent support poles for rotation about an axis parallel to the support poles.

The present invention also provides a foldable frame. The foldable frame includes a plurality of cross poles and a plurality of movable support poles. A plurality of cross poles are pivotally coupled to one another. Each support pole is configured to move between a first position in which the support pole extends parallel to one of the plurality of cross poles and a second position in which the support pole extends perpendicular to one of the plurality of cross poles.

The present invention also provides a method for setting up a portable shelter. The method includes providing a frame having a plurality of cross poles and a plurality of support poles in a collapsed state. In the collapsed state, the plurality of cross poles includes a first cross pole having a first end and a second end, a second cross pole extending substantially parallel to the first cross pole and having a first end and a second end, a third cross pole having a first end pivotally coupled to the first end of the first cross pole and a second end pivotally coupled to the second end of the second cross pole, and a fourth cross pole crossing the third cross pole and having a first end pivotally coupled to the first end of the second cross pole and a second end pivotally coupled to the second end of the first cross pole. The plurality of support poles includes a first support pole extending substantially parallel to the first cross pole, a second support pole extending substantially parallel to the second cross pole, a third support pole extending substantially parallel to the third cross pole and a fourth support pole extending substantially parallel to the fourth cross pole. The method also includes the steps of pivoting the plurality of cross poles to a rectangular position wherein the first and second cross poles extend parallel to one another and wherein the third and fourth cross poles extend parallel to one another. The plurality of support poles are also pivoted to a supporting position. In the supporting position, each support pole extends perpendicular to the plurality of cross poles.

The present invention also provides an apparatus for supporting a canopy. The apparatus includes a frame having a plurality of cross poles and a plurality of support poles in a collapsed state. In the collapsed state, the plurality of cross poles includes a first cross pole having a first end and a second end, a second cross pole extending substantially parallel to the first cross pole and having a first end and a second end, a third cross pole having a first end pivotally coupled to the first end of the first cross pole and a second end pivotally coupled to the second end of the second cross pole, and a fourth cross pole crossing the third cross pole and having a first end pivotally coupled to the first end of the second cross pole and a second end pivotally coupled to the second end of the first cross pole. The plurality of support poles includes a first support pole extending substantially parallel to the first cross pole, a second support pole extending substantially parallel to the second cross pole, a third support pole extending substantially parallel to the third cross pole and a fourth support pole extending substantially parallel to the fourth cross pole. The plurality of cross poles pivot to a rectangular position such that the first and second

cross poles extend parallel to one another and such that the third and fourth cross poles extend parallel to one another. The plurality of support poles are movable to a supporting position such that each support pole extends perpendicular to the plurality of cross poles.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a perspective view of a foldable frame structure in an expanded state and including a canopy cover and canopy support structure.

FIG. **2** is a perspective view of the foldable frame structure of FIG. **1** in a collapsed mode illustrating the relative size difference in collapsed and expanded state.

FIG. **3** is a schematic view of the foldable frame structure FIG. **1** illustrating the structure in a collapsed state.

FIG. **4** is a schematic view of the foldable frame structure of FIG. **1** illustrating the structure during a first opening phase.

FIG. **5** is a schematic view of the foldable frame structure of FIG. **1** illustrating the structure during a second opening phase.

FIG. **6** is a schematic view of the foldable frame structure of FIG. **1** illustrating the structure during a third opening phase.

FIG. **7** is a fragmentary exploded view of a pivotal joint assembly of the foldable frame structure.

FIG. **8** is a sectional view of the pivotal joint of FIG. **7** taken along lines **8**—**8** illustrating a cross pole and a support pole coupled to the pivotal joint.

FIG. **9** is a sectional view of the pivotal joint of FIG. **8** taken along lines **9**—**9**.

FIG. **10** is a perspective view of the cross pole and the support pole illustrating a telescoping feature of the cross pole and support pole.

FIG. **11** is a sectional view of the shelter of FIG. **10** taken along lines **11**—**11**.

FIG. **12** is a sectional view of the foldable frame structure of FIG. **1**.

FIG. **13** is an enlarged fragmentary sectional view of the shelter of FIG. **12** taken along lines **13**—**13**.

FIG. **14** is an enlarged fragmentary perspective view of the shelter of FIG. **1** with portions broken away to illustrate a detachable foot mechanism connected to the support pole.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

I. OVERVIEW

FIGS. **1** and **2** are perspective views of a foldable frame structure **19**. FIG. **1** is a perspective view of the foldable canopy **18** including foldable frame structure **19** comprising a plurality of support poles **20** and a plurality of cross poles **22**. FIG. **2** illustrates the foldable frame structure **19** in collapsed mode.

As shown in FIG. **1**, foldable canopy **18** includes a canopy cover **24**, a canopy support tension system **26**, and a foldable frame structure **19**. The canopy cover **24** is attached to the foldable frame structure **19**. Such canopy covers **24** are conventionally known in the art and provide shelter from the elements. Canopy cover **24** can be made from a variety of suitable material including plastic tarpaulins, natural fibrous based materials, nylon, or other light weight materials commonly used as coverings in outdoor canopies and tents. Canopy tension system **26** is commonly known and provides support to the canopy cover **24**.

Foldable frame structure **19** comprises a plurality of cross poles **22**, a plurality of support poles **20** and a plurality of clamping feet **28**. The cross poles **22** are coupled together by pivotal joints **30***a*, **30***b*, **30***c*, and **30***d* (FIG. **3**). Cross poles **22** supply a perimeter frame structure to the foldable canopy **18**. The cross poles **22** preferably comprise a conventionally known support tubing or poles such as hollow aluminum or plastic tubing or alternatively any one of a variety of other flexible or inflexible material suitable for a frame structure.

The support poles **20** are selectively coupled to the cross poles **22** by pivotal joints **30***a*, **30***b*, **30***c* and **30***d* (FIG. **3**). The support poles **20** provide vertical support to the canopy structure **18**. The support poles **20** are foldable in order to collapse the structure **19** (FIGS. **5** and **10**). The support poles **20** preferably comprise a conventionally known support tubing or poles such as hollow aluminum or plastic tubing or alternatively any one of a variety of other flexible or inflexible material suitable for a frame structure.

Clamping feet **28** are attached to the base of support poles **20**. Feet **28** provide a means for both stabilizing the support poles **20** and for coupling the support poles **20** to the cross poles **22** when folded (See FIG. **14**).

As shown by FIG. **2**, canopy **18** or alternatively foldable frame structure **19** is collapsible providing a relative size advantage over the expanded structure **19** for transportation and storage.

FIGS. **3**–**6** are schematic views illustrating the foldable frame structure **19** of FIG. **1** being converted from the collapsed state to the expanded state. FIG. **3** illustrates the foldable frame structure **19** in the collapsed state in greater detail including pivotal joint **30***a* and a plurality of cross poles **20**. As shown by FIG. **3**, pivotal joints **30***a*, **30***b*, **30***c*, **30***d* allow cross poles **22** to be rotated so that in a collapsed state the cross poles **22***a* and **22***b* are parallel while cross poles **22***c* and **22***d* cross one another in an X fashion. This allows foldable frame structure **19** to be collapsed to the length of a single cross pole **22** and the width of approximately two times the girth of a cross pole **22** while in the collapsed state.

FIG. **4** illustrates structure **19** in the first opening phase necessary to expand the structure **19**. Foldable frame structure **19** rotates from collapsed mode or state (FIG. **3**) about the axes of pivotal joints **30***c* and **30***d* allowing the terminus of pivotal joint **30***b* to be moved in the direction of arrow **300**. As pivotal joint **30***b* finishes the rotation in the direction indicated by arrow **306**, it moves from being adjacent to pivotal joint **30***a* (FIG. **3**) to the end of the structure **19** opposite pivotal joint **30***a* (FIG. **4**). As shown in FIG. **4**, the cross bars **22** are positioned such that pole **22***b* is adjacent to pole **22***c* and pole **22***d* is adjacent to pole **22***a* in the first opening phase.

FIG. **5** illustrates structure **19** in the second opening phase with cross poles **22** extended to an open position. The second opening phase is accomplished by extending pivotal joint **30***c* laterally in the direction of arrow **302** and joint **30***d* laterally in the direction of arrow **304**. Pivotal joints **30***a* and **30***d* contain an angle restriction mechanism **110** (see FIG. **11**) preventing extension of **30***a* and **30***d* further than the angle necessary to accomplish a rectangular frame formation. Angle restriction mechanism **110** also prevents foldable frame structure **19** from being folded improperly by allowing only pivotal joint **30***b* to rotate the 270 degree angle necessary to accomplish folded configuration as shown FIG. **3**.

FIG. **6** illustrates structure **19** in the third opening phase with support poles **20** extended. The third opening phase is

accomplished by unfolding support poles **20**, as shown by arrows **308**, to the vertical position from the folded position where support poles **20** are clamped to cross poles **22**. In the preferred embodiment, support poles **20** mate with the pivotal joints **30***a*, **30***b*, **30***c*, and **30***d*. By accepting and internally receiving support poles **20**, pivotal **30***a*, **30***b*, **30***c*, and **30***d* lend stability to the frame structure **19**. In the third opening phase, support poles **20** and cross poles **22** are telescopically extended along arrows **214** and **216** to expand the size of frame structure **19**.

In the preferred embodiment, the telescopic mechanism **220** consists of sliding sections which allow the poles **20** and **22** to be elongated. In an alternative embodiment, the telescopic mechanism **220** is replaced with hinges which allow the poles **20** to be elongated.

In one embodiment of the present invention, the foldable frame **19** includes four cross poles **22** joined to form a rectangular perimeter. In alternative embodiments, the foldable frame **19** includes varying numbers of cross poles **22** joined to form perimeters having linear segments, such as triangles, octagons, etc.

The benefit of foldable structure **19** stems from the simplicity of the structure, and the straightforward set-up and take-down. To unfold structure **19**, first the user rotates the end of pivotal joint **30***b* to the opposite end of the structure. Second, the user opens the perimeter of the structure **19** by extending joints **30***c* and **30***d* laterally. Thirdly, the user unfolds support poles **20**. Lastly, user extends telescopic mechanisms **200** (see FIG. **10**) of support poles **20** and cross poles **22**.

II. PIVOTAL JOINT

FIGS. **7–9** illustrate pivotal joint **30***a* in greater detail. In particular, FIG. **7** is a fragmentary exploded view of the pivotal joint **30***a*. FIG. **8** is a cross-sectional view of pivotal joint **30***a* illustrating support pole **20** and cross pole **22** coupled to pivotal joint **30***a*. FIG. **9** is a sectional view of pivotal joint **30***a* illustrating an angle restriction mechanism **110**. Pivotal joint **30***d* is substantially identical to pivotal joint **30***a*. Pivotal joints **30***b* and **30***c* are substantially identical to pivotal joint **30***a* except that joints **30***b* and **30***c* omit an angle restriction mechanism described hereafter. As shown by FIG. **7**, pivotal joint **30***a* generally includes a first joint module **40**, a second joint module **60**, a joint cap **90**, and a joint base bushing **80**. First joint module **40** comprises a generally rigid housing or casing having an anterior end **42** and a second posterior end **50**. Anterior end **42** has a horizontal interior portion **44** to support cross pole **22** and a top bore **46** for inserting a pin, screw, or other fastener to secure cross pole **22**. Posterior end **50** has a vertical interior portion **52**, a top perimeter lip **54**, a top bore **58**, a outward blocking projection **57**, and a rear horizontal bore **59**. Vertical interior portion **52** receives joint base bushing **80** and joint cap **90**. Perimeter lip **74** provides separation between first joint module **40** and joint cap **90** reducing friction during rotation. Top bore **58** allows insertion of a pin, screw, or other fastener additionally securing cross pole **22**. Rear horizontal bore **59** allows insertion of a pin, screw, or other fastener to secure joint cap **90** and joint base bushing **80** coupling the pivotal joint components to form the pivotal joint **30***a*. Outward blocking projection **57** functions as a component of angle restriction mechanism **110** (FIG. **9**).

As shown in FIG. **7**, the second joint module **60**, like first joint module **40**, comprises a generally rigid housing or casing having an anterior end **62** and a second posterior end **70**. Anterior end **62** has a horizontal interior portion **64** to define or support cross pole **22** and a top bore **66** for inserting a pin, screw, or other fastener to secure cross pole **22**. Posterior end **70** has a vertical interior portion **72**, a top perimeter lip **74**, and a top bore **76**. Vertical interior portion **72** accepts joint base bushing **80**. Perimeter lip **74** includes a lip projection **78** that operates as component of angle restriction mechanism **110**. Perimeter lip **74** provides separation between first joint module **40** and second joint module **60** reducing friction during rotation and allowing for rotation of outward blocking projection **57**. Top bore **76** allows insertion of a pin, screw, or other fastener additionally securing cross pole **22**.

Joint base bushing **80** is an elongate cylinder to be fitted to vertical interior portion **72** of first joint module **40** and vertical interior portion **52** of second joint module **60**. Bushing **80** provides a smooth cylinder to accept support pole **20**. Bushing **80** includes a retention flange **82**, lateral base bushing bore **84**, and bushing vertical interior **86**. Retention flange **82** facilitates assembly, retains second joint module **60**, and provides a butting for ridge **120** on support pole **20**. Lateral base bushing bore **59** aligns with rear horizontal bore **59** to allow for insertion of pin, screw, or other connecting means to couple components of pivotal joints **30***a*, **30***b*, **30***c*, and **30***d* to form pivotal joints **30***a*, **30***b*, **30***c*, and **30***d*. Bushing vertical interior **86** accepts support pole **20** when pole **20** is in an unfolded state.

Joint cap **90** is a rigid or solid member coupled to first joint module **50** and joint base bushing **80**. As shown in FIG. **7**, joint cap **90** includes rear cap bore **92**, declinating ridge **94**, a bottom projection **96**, and an interior tension cord **98**. Rear cap bore **92** aligns with rear horizontal bore **59** to allow for insertion of pin, screw, or other connecting means to couple cap to pivotal joint **30**. When coupled to first joint module **40**, declinating ridge **94** defines an internal boundary to delineate a void to accept joint base bushing **80**. Bottom projection **96** inserts into support pole notch **122** to limit rotation when support pole **22***a*, **22***b*, **22***c*, **22***d* are coupled to pivotal joints **30***a*, **30***b*, **30***c*, and **30***d*. In the preferred embodiment, interior tension cord **98** comprises an elastic cord coupled between the support pole **20** and cap **90**. Tension cord **98** allows the support poles **20** to be selectively inserted and removed from pivotal joints **30***a*, **30***b*, **30***c*, and **30***d* while remaining attached to pivotal joints **30***a*, **30***b*, **30***c*, and **30***d*. Additionally, tension cord **98** facilitates guidance of support pole **20** into the internal aperture **86** of the pivotal joints **30***a*, **30***b*, **30***c*, and **30***d* defined by joint base bushing **80**. In an alternative embodiment, elastic tension cord **98** is replaced with other inelastic material. In another embodiment elastic tension cord is replaced with a hinge, rod, or other mechanism which allows the support poles **20** to be folded while maintaining connection with pivotal joints **30***a*, **30***b*, **30***c*, and **30***d*. In another embodiment, a coupling means such as a tension cord **98** or hinge is absent altogether.

FIG. **8** illustrates bottom projection **96** inserted into support pole notch **122** in greater detail. Pivotal joint **30***a* is coupled with cross poles **22** by a pair of screws, pins, or other attachment means inserted through bores **46** and **58**. Joint cap **90** is attached to first joint module **50**, second joint module **60**, and joint base bushing **80** by tension core **98**. As a result, cord **98** is easily serviced. Alternatively, joint cap **90** may be secured to module **50** by means of a screw, pin, or other attachment mechanism through rear horizontal bore **59** and joint base bore **84**. Retaining flange **82** retains second joint module **60** to the rest of pivotal joint **30**. Tension cord **98** is coupled internally to joint cap **90** and support pole **20**.

As shown in FIG. **9**, pivotal joint **30***a* includes internal angle restriction mechanism **110**. Angle restriction mecha-

nism **110** includes outward blocking projection **57** extending from base of first joint module **40** and a lip projection **78** extending from perimeter lip **74** of second joint module **60**. Projections **57** and **78** oppose one another to restrict rotation of pivotal joints **30***a* and **30***d* (shown in FIG. **3**) to given angles. When projections **57** and **78** are not touching, pivotal joints **30***a* and **30***d* may rotate such that projection **78** may move in the direction of either arrow **111** or **112** with respect to projection **57**. Once the projections **57** and **78** butt, the joints can only rotate such that projection **78** moves in the direction indicated by arrow **112** with respect to projection **57**. The angle restriction mechanism **110** facilitates both folding and expansion of foldable frame structure **19**. By restricting the range of rotation in the pivotal joints **30***a* and **30***d*, the angle restriction mechanism ensures that the frame **19** will fold properly. Similarly, by restricting the scope of rotation in the pivotal joints **30***a* and **30***d*, the angle restriction mechanism stops rotation of the joints **30***a* and **30***d* when it is extended in the open state shown in FIG. **5**. This lends stability to structure **19** by preventing excessive rotation of joints **30** when in an open state, thus helping to maintain a proper perimeter frame shape. In the embodiment of foldable frame structure **19** which includes four cross poles **22** so as to form a rectangle, angle restriction mechanism restricts joints at **90** degree angles when opened.

Pivot joints **30***b* and **30***c* rotate freely relative to one another. In the exemplary embodiment, joint modules **40** and **60** of pivotal joints **30***b* and **30***c* omit projections **57** and **78** such that modules **40** and **60** freely rotate relative to one another. In an alternative embodiment, module **60** includes a vertically extending bore and a removable metal pin in lieu of projection **78**. In pivotal joints **30***a* and **30***d*, the pin is inserted through the bore and projects between modules **40** and **60** to engage projection **78** and to limit angular rotation of module **40** relative to module **60**. In pivotal joints **30***b* and **30***c*, the pin is simply removed such that modules **40** and **60** may freely rotate relative to one another. In yet another alternative embodiment, modules **40** and **60** are simply reversed in pivotal joints **30***b* and **30***c* such that projection **57** extends along a top of module **40**, such that projection **78** extends along a bottom of module **60** and such that projections **57** and **78** are out of engagement with one another to enable free relative rotation.

III. TELESCOPIC MECHANISM

FIG. **10** further illustrate cross poles **22** and support poles **20** including telescopic mechanism **200** which permits the poles **20** and **22** to be extended to increase the size of foldable frame structure **19** when in the expanded state. FIG. **11** illustrates telescoping mechanism **200** in greater detail including detent mechanism **201**. As shown by FIG. **10**, cross poles **22** and support poles **20** include telescopic mechanism **200** which permits poles **20** and **22** to be extended.

As best shown by FIG. **11**, telescopic mechanism **200** includes a first section **220**, a second section **222**, detent mechanism **201**, a telescopic bushing **208**, and a telescopic retention flange **205**. The first section **220** fits inside the second section **222**. This allows first section **220** and second section **222** to be selectively extended with first section **220** moving in the direction of arrow **214** and second section **222** in the direction of arrow **216**. By moving sections **220** and **222** in the opposite direction of arrows **214** and **216**, the telescopic feature **200** is collapsed. Telescopic bushing **208** eliminates direct contact of the first section **220** and the second section **222** when sections are being extended or retracted, reducing frictional resistance on the sections **220** and **222**. Telescopic bushing **208** is coupled to section **220** and includes a bushing lip **209**. Telescopic retention flange **205** is coupled to section **222**. Flange **205** further eliminates direct contact of first section **220** and the second section **222** when section are being extended or retracted, reducing frictional resistance on the section **220** and **222**. Flange **205** also prevents bushing lip **209** from passing, preventing the first section **220** and the second section **222** from being separated during extension.

Detent mechanism **201** includes a pin **204**, a pin spring **202**, a pin base **206**, and a detent **207**. Pin base **206** is integrally formed with cap **208**. Pin base **206** contains pin spring **202** and pin **204** in the interior of the first section **220**. Pin spring **202** exerts outward force on the pin **204**. Pin **204** extends through detent **207** locking the telescopic mechanism **200** in one or more positions.

IV. CANOPY SUPPORT TENSION SYSTEM

FIGS. **12** and **13** illustrate canopy support tension system **26**. Canopy support tension system **26** includes support pole **101** and support straps **100**. As shown in FIG. **13**, support straps **100** are coupled to pivotal joint **30***a*. FIG. **8** illustrates one embodiment of the coupling of joint **30***a* and strap **100** in better detail. The support strap **100** is integrated into the joint cap **90** with an internal pin or dowel **102**. In alternative embodiments support strap **100** is integrated into joint cap **90** by a clamp or other mechanism. In another alternative embodiment, support strap **100** is integrated to other portions of the pivotal joint **30***a*. Support pole **101** is coupled at the base to support straps **100**. Support pole **101** provides internal support to canopy **24** when the foldable frame structure **19** is expanded. Support pole **101** may be a pole or rod and is preferably comprised of a conventionally known support tubing such as hollow aluminum or plastic tubing or alternatively any one of a variety of other flexible or inflexible material suitable for a frame structure.

As shown in FIG. **12**, when the foldable frame structure **19** is fully expanded, straps **100** are taut. This creates vertical pressure on the base of support pole **101** lending internal support to canopy **24**. In the preferred embodiment at least one of the straps **100** is adjustable by means of an adjustment mechanism **103**. Thus the user may tighten or loosen straps increasing pressure on base of support pole **101** to raise or lower the pole. The benefit of a canopy support tension system **26** is that it is simple, light weight, and out of the way of users passing underneath.

V. CLAMPING FOOT

FIG. **14** illustrates clamping foot **24**. As shown in FIG. **14** clamping foot includes internal hub **140**, clamping extensions **142**, and stake bore **144**. Internal hub **140** couples foot **24** to support pole **20**. Clamping extensions **142** selectively attach foot **24** to cross pole **22** when in folded position (also shown in FIG. **10**.) In addition, the wide base provided by extensions **142** provides lateral stability to prevent the support poles from tipping and additionally prevents the poles from embedding into dirt, sand, or other soft substrate. Stake bore **144** allows stake, rope or other securing device to be inserted to further secure the support pole **20** and foldable frame structure **19** to the ground or surrounding objects. Stake bore **144** allows the structure to be used on uneven ground or in adverse weather conditions.

VI. CONCLUSION

The foldable frame structure **19** provides a simplified structure, eliminates the need for a two-person set-up, and

provides a lighter structure facilitating set-up, take-down, and portability. The simplified structure is accomplished by coupling cross poles **22** and support poles **20** which contain a telescopic mechanism **200**, and by means of a pivotal joints **30***a*, **30***b*, **30***c*, and **30***d*. The telescopic mechanism **200** allows the poles **20** and **22** to be shortened to a fraction of their expanded length. The pivotal joints **30***a*, **30***b*, **30***c*, and **30***d* allow support poles **20** to be folded and attached to the cross poles **22**. The pivotal joints **30***a*, **30***b*, **30***c*, and **30***d* additionally allow the cross poles **22** to be folded to accomplish the collapsed state. This allows the frame structure **19** to be collapsed to a fraction of its expanded size. The clamping foot **28**, the pivotal joint interior tension cord **98**, and the joint restriction mechanism **110** all facilitate one-person set-up, and take-down of the structure. Finally, the canopy support tension system **26** provides simplified internal support that eliminates obstructions that would otherwise restrict free movement into and out of the tent.

Although the present invention has been described with reference to preferred embodiments, workers skilled in the art will recognize that changes may be made in form and detail without departing from the spirit and scope of the invention. The present invention described with reference to the preferred embodiments as set forth in the following claims is manifestly intended to be as broad as possible. For example, unless specifically otherwise noted, the claims reciting a single particular element also encompass a plurality of such particular elements.

What is claimed is:

1. A foldable shelter, the shelter comprising:

a canopy; and

a frame supporting the canopy, the frame including:

a plurality of support poles; and

a plurality of cross poles, each cross pole being pivotally coupled, between adjacent support poles for rotation about an axis parallel to the support poles such that the adjacent cross poles are rotated relative to each other between a collapsed position and an opened position;

wherein, the support poles are movable between a first position in which the support pole extends parallel to one of the plurality of cross poles and a second position in which the support pole extends perpendicular to said one of the plurality of cross poles.

2. The shelter of claim **1**, wherein the shelter includes:

a pivotal joint coupled between adjacent cross poles, wherein the joint selectively accepts the support pole.

3. The shelter of claim **2**, wherein the pivotal joint includes:

a locking mechanism coupled between at least one support pole and the pivotal joint, wherein the locking mechanism is configured to prevent pivoting of the pivotal joint from a given angle upon the acceptance of the support pole.

4. The shelter of claim **2**, wherein the shelter includes:

an elastic cord coupled between the support pole and the pivotal joint.

5. The shelter of claim **1**, wherein each cross pole includes:

a first section; and

a second section telescopically receiving the first section to allow the cross pole to be extended.

6. The shelter of claim **5**, wherein at least one cross pole includes:

a pin coupled to one of the first section and the second section; and

a detent formed in the other of the first section and the second section, wherein the pin is adapted to fit into the detent to secure the first section relative to the second section.

7. The shelter of claim **6**, wherein each cross pole includes:

a first surface; and

a second surface, wherein the first surface is aligned to the second surface and wherein the detent is aligned with the pin to accept the pin.

8. The shelter of claim **1**, wherein each support pole includes a first section; and

a second section telescopically receiving the first section to allow the support pole to be extended.

9. The shelter of claim **8** wherein at least one support pole includes:

a pin and a detent, the pin adapted to lock into the detent to secure the at least one support pole in at least at one selected length.

10. The shelter of claim **8**, wherein the shelter includes:

a bushing cap coupled to one of the first section and the second section.

11. The shelter of claim **8**, wherein the support poles include:

a foot including extensions configured to releasably receive one of the plurality of cross poles when the support pole extends along said one of the plurality of cross poles.

12. The shelter of claim **1**, including:

a detachable means for joining the canopy to the frame.

13. The shelter of claim **1**, wherein the plurality of cross poles pivot to a collapsed state and wherein the plurality of cross poles, in the collapsed state, include:

a first cross pole having a first end and a second end;

a second cross pole extending substantially parallel to the first cross pole and having a first end and a second end;

a third cross pole having a first end pivotally coupled to the first end of the first cross pole and a second end pivotally coupled to the second end of the second cross pole; and

a fourth cross pole crossing the third cross pole and having a first end pivotally coupled to the first end of the second pole and a second end pivotally coupled to the second end of the first pole.

14. A foldable frame for use with a canopy, the frame comprising:

a plurality of support poles; and

a plurality of cross poles, wherein each support pole is movable between a collapsed state in which the support poles extend substantially parallel to the plurality of cross poles and an extended state in which the support poles extend substantially perpendicular to the plurality of cross poles and wherein each cross pole is pivotally coupled between adjacent support poles for rotation about an axis parallel to the support poles when the support poles are in the extended position, and the adjacent cross poles are rotated relative to each other between a collapsed position and an opened position.

15. The frame of claim **14**, wherein the frame includes:

a pivotal joint coupled between adjacent cross poles wherein the joint selectively accepts the support pole.

16. The frame of claim **14**, wherein the pivotal joint includes:

a locking mechanism configured to prevent rotation of the pivotal joint from a given angle upon the acceptance of the support pole.

17. The frame of claim **14**, wherein each cross pole includes:

a first section; and

a second section telescopically receiving the first section to allow the cross pole to be extended.

18. The frame of claim **17**, wherein each cross pole includes:

a pin coupled to one of the first section and the second section; and

a detent formed in the other of the first section and the second section, wherein the detent pin is adapted to fit into the detent pin aperture to secure the first section relative to the second section.

19. The frame of claim **18**, wherein each cross pole includes:

a first surface; and

a second surface, wherein the first surface is aligned to the second surface and wherein the detent is aligned with the pin to accept the pin.

20. The frame of claim **14**, wherein each support pole includes:

a first section; and

a second section telescopically receiving the first section to allow the support pole to be extended.

21. The frame of claim **20**, wherein each support pole includes:

a pin and a detent, the pin adapted to lock into the detent to secure each support pole at least at one selected length.

22. The frame of claim **20**, wherein the frame includes:

a bushing cap coupled to one of the first section and the second section, wherein the bushing cap eliminates metal on metal contact of the first and second sections.

23. The frame of claim **14**, wherein at least one of the plurality of support poles includes:

a foot including extensions configured to releasably receive one of the plurality of cross poles when the at least one support pole extends along said one of the plurality of cross poles.

24. The frame of claim **14**, wherein the frame includes:

at least one elastic cord coupling each support pole and each cross pole.

25. The frame of claim **14**, wherein the frame includes:

means for detachably joining a canopy to the frame.

26. A method for setting up a portable shelter comprising:

providing a frame having a plurality of cross poles and a plurality of support poles in a collapsed state, wherein the plurality of cross poles includes a first cross pole having a first end and a second end, a second cross pole extending substantially parallel to the first cross pole and having a first end and a second end, a third cross pole having a first end pivotally coupled to the first end of the first cross pole and a second end pivotally coupled to the second end of the second cross pole, and a fourth cross pole crossing the third cross pole and having a first end pivotally coupled to the first end of the second cross pole and a second end pivotally coupled to the second end of the first cross pole, and wherein the plurality of support poles includes a first support pole extending substantially parallel to the first cross pole, a second support pole extending substantially parallel to the second cross pole, a third support pole extending substantially parallel to the third cross pole, and a fourth support pole extending substantially parallel to the fourth cross pole;

pivoting the plurality of cross poles to a rectangular position wherein the first and second cross poles extend parallel to one another and wherein the third and fourth cross poles extend parallel to one another; and

pivoting the plurality of support poles to a supporting position, wherein each support pole extends perpendicular to the plurality of cross poles.

27. The method of claim **26** including:

telescopically extending at least two of the plurality of cross poles.

28. The method of claim **26** including:

telescopically extending each of the plurality of support poles.

29. An apparatus for supporting a canopy, the apparatus comprising:

a frame having a plurality of cross poles and a plurality of support poles in a collapsed state, wherein the plurality of cross poles include a first cross pole having a first end and a second end, a second cross pole extending substantially parallel to the first cross pole and having a first end and a second end, a third cross pole having a first end pivotally coupled to the first end of the first cross pole and a second end pivotally coupled to the second end of the second cross pole, and a fourth cross pole crossing the third cross pole and having a first end pivotally coupled to the first end of the second cross pole and a second end pivotally coupled to the second end of the first cross pole, and wherein the plurality of support poles includes a first support pole extending substantially parallel to the first cross pole, a second support pole extending substantially parallel to the second cross pole, a third support pole extending substantially parallel to the third cross pole, and a fourth support pole extending substantially parallel to the fourth cross pole, wherein the plurality of cross poles pivot to a rectangular position such that the first and second cross poles extend parallel to one another and such that the third and fourth cross poles extend parallel to one another, and wherein the plurality of support poles are movable to a supporting position such that each support pole extends perpendicular to the plurality of cross poles.

30. A foldable shelter, the shelter comprising:

a canopy; and

a frame supporting the canopy, the frame including:

a plurality of support poles; and

a plurality of cross poles, each cross pole being pivotally coupled between adjacent support poles for rotation about an axis parallel to the support poles, such that the adjacent cross poles are rotated relative to each other between a collapsed position and an opened position,

a pivotal joint coupled between adjacent cross poles, wherein the joint selectively accepts one of the support pole;

a locking mechanism coupled between one of the support pole and the pivotal joint, wherein the locking mechanism is configured to prevent pivoting of the pivotal joint from a given angle between the adjacent cross poles upon the acceptance of the at least one support pole.

31. The foldable shelter of claim **30** wherein each cross pole includes:

a first section;

a second section telescopically receiving the first section to allow the cross pole to be extended;

a pin coupled to one of the first section and the second section; and

a detent formed in the other of the first section and the second section, wherein the pin is adapted to fit into the detent to secure the first section relative to the second section.

32. The foldable shelter of claim **31** wherein each support pole includes:

a first section;

a second section telescopically receiving the first section to allow the support pole to be extended;

a pin and a detent, the pin adapted to lock into the detent to secure the at least one support pole in at least at one selected length.

33. The foldable shelter of claim **30** wherein the support poles include a foot including extensions configured to releasably receive one of the plurality of cross poles when the support pole extends along said one of the plurality of cross poles.

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